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Aims and Scope

Journal of Water and Wastewater (Ab va Fazilab) is a bimonthly journal that publishes peer-reviewed research focusing mainly on integrated municipal water management and water supply with special concern to water resources management at catchment areas. While covering a wide variety of general topics and challenges involving usual municipal water and wastewater management which in itself are reflected from physical, natural and human activities in the urban residential area, the Journal has special emphasizes over issues that are reflected from suburban, river basin and catchment areas.

Bimonthly Journal of Water and Wastewater (Ab va Fazilab) has been published onward in Persian with English abstract since 1989.

It is an open access, peer-reviewed bimonthly of Water and Wastewater sciences, published on behalf of the Water and Wastewater Consulting Engineers.

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All articles published by Water and Wastewater (Ab va Fazilab) Journal are made freely and permanently accessible online immediately upon publication.

The following shows some examples of the journals main fields of study:

- Rural and municipal water supply management (Conventional & Unconventional Sources)
- Municipal water demand management (unaccounted for water, water reuse and Water-Saving tips)
- Urban hydrology (urban runoff, urban flooding, echo hydrology etc.)
- Processes (physical, chemical and biological), technologies and strategies in water treatment and also municipal, industrial and rural wastewater treatment
- Application of mathematical modeling in water and wastewater treatment processes- Public health issues related to water and wastewater
- Water reuse (environmental and health impacts)
- Waste sludge management (treatment, disposal and reuse)
- Water and wastewater operation and maintenance- Sanitation and protection of aquatic ecosystems and water resources (surface and ground water)
- Urban water accidents managements, data collection, standards, regulations and strategies related to water and wastewater management
- Water governance and Sustainable water resources management and pollution control.

Journal of Water and Wastewater (Ab va Fazilab)is indexed by srlst.com , SID.ir and magiran.com and has an Impact Factor of 0/2 among Iranian science and technical journals in ISC. ISC is a system which deals with analysis and ranking authors, publications and institutes.(Regional Information for Science and Technology)

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Synthesis of Manganese Dioxide Nano-particles (MnO_2) and Their Copper Removal Efficiency from Aqueous Solutions

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Abstract

Removal of copper from aqueous solutions was investigated using manganese dioxide nanoparticles as a new and suitable adsorbent. For this purpose, manganese dioxide nanoparticles were synthesized using the cathode electrochemical deposition method and the effects of pH, contact time, MnO_2 concentration, and copper concentration on copper removal efficiency were investigated in a batch system. Scanning electron microscope (SEM), XRD, and FTIR were used to characterize the synthesized manganese dioxide nanoparticles. Results showed that nanoparticle diameters ranged from 30 to 50 nm and that a copper adsorption efficiency of above 96% percent would be achieved at an optimum pH of 7. It was found that increasing the copper concentration and reducing adsorbent dosage led to enhancements in adsorption capacity but slight reductions in adsorption efficiency. Experimental data also indicated that copper adsorption fitted the Freundlich model with an adsorption capacity of above 169 mg.g^{-1} and that it obeyed a pseudo-second order kinetic equation. It was concluded that manganese dioxide nanoparticles may be used as a suitable adsorbent with a high potential for the removal of copper from aqueous solutions.

Keywords: MnO_2 Nanoparticles, Electrochemical Synthesis of Cathode, Copper Removal, Aqueous Solutions.

Preparation of Diethylenetriamine Modified Polyacrylonitrile Nanofibers for Cadmium Ion Adsorption

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Abstract

In this study, the electrospinning method was used to manufacture polyacrylonitrile (PAN) nanofibers. The procedure involved spinning a solution of 10%wt PAN in dimethyl formamide (DMF) in an electric field of 21 kV and with a tip to collector distance of 16 cm. The nanofibers thus obtained had an average diameter of 100 nm. Then, scanning electron microscopy (SEM) images were used to investigate the morphology of the nanofibers. In the next step, the nanofiber surface was modified with diethylenetriamine and FTIR was employed to ensure the presence of amines on the nanofiber surface. The functionalized nanofibers were then used for the first time to adsorb ions of cadmium (a heavy metal with industrial applications) and its adsorption capacity was evaluated. The chemical characteristics of the nanofibers and the effects of such parameters as pH, temperature, and contact time on adsorption efficiency were investigated. The results showed that maximum adsorption efficiency was achieved within the first 10 minutes of the process at a pH in the range of 5–7 when about 80% of the cadmium ions were adsorbed. Moreover, only slight changes were observed with longer contact times or with increasing temperature. Finally, the adsorption data fitted well with the Langmuir isotherm

Keywords: Nanofibers, Polyacrylonitrile, Cadmium, Modified, Adsorption.

Effects of Electrical Current on Fungal and Bacterial Removal from Water

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Abstract

Removing pathogens from water to prevent the spread of water-borne diseases is of great importance. The present study was designed and implemented to investigate the effects of electric current on *Staphylococcus aureus* bacteria, *Escherichia coli*, and the *Candida albicans* yeast. For this purpose, nutrient Agar and Sabouraud Dextrose Agar were used as the media to activate the bacteria and yeasts, respectively. Part of the colony from each medium was taken into an experimental tube to prepare suspensions. The number of microorganisms in 1 cc of each suspension was calculated at time zero and the suspension was poured into the electrolysis container. Samples of the microbial suspensions were taken in triplicates after 5, 10, 15, 20, 25, and 30 minutes and transferred into the culture medium. Measurements were recorded upon completion of the incubation period. It was found that the bacteria and the yeast could be killed using a voltage of 16.5 v and a current of mA such that the number of *E. coli* decreased significantly after 25 and 30 minutes. The results indicate that each microorganism species exhibits its own characteristic sensitivity to electrical current so that increased voltage and/or prolonged exposure to the current will have a higher inhibitory effect on the growth of most species of microorganism.

Keywords: Electrical Current, *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans*.

Sulfide Removal from Wastewater Using the New Microbial Fuel Cell Technology with Simultaneous Clean Energy Generation

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Abstract

Wastewater is nowadays a major concern in human societies that has encouraged many scientists to direct their efforts at developing new and efficient methods for its treatment. Most of the methods so far proposed or developed are time-consuming and/or cost intensive. Microbial Fuel Cell (MFC) is a new technique that is capable of direct conversion of the chemical energy due to wastewater treatment into electrical energy. Most treatment processes commonly release sulfide ions that are highly toxic and detrimental. In the method proposed in this study, the sulfide ions generated during wastewater treatment were used as electron donors in the anaerobic compartment of a dual chamber microbial fuel cell and the removal of different concentrations of sulfide ions and the power generated were studied. For this purpose, the effects of three different concentrations of sulfide (0.1, 0.8, and 1.5 g.l⁻¹) on MFC performance were explored to find that a sulfide removal efficiency of 98% could be achieved after 21h, 6 days, and 10 days, respectively. Also, cyclic voltammetry was used for the detection of electrochemical activity by microorganisms and sulfide oxidation in the anode chamber.

Keywords: Wastewater Treatment, Dual Chamber Microbial Fuel Cell, Sulfide Removal.

Adsorption of Reactive Red Dye from Aqueous Solution Using Modified Citrulluscolosynthis Ash

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Abstract

Dye-bearing wastes pose serious risks to and leave harmful effects on the environment. Increasing wastewater color intensity leads to reduced light reaching the aquatic environment, which adversely affects the life and growth of aquatic plants and invertebrates. Among the many methods available for dye removal from wastewater, membrane separation, oxidation, coagulation, and anaerobic treatment are more common but they are all costly and involve complex processes. Biosorption, in contrast, enjoys both ease of application and simple design so that it is widely used for removing dyes, heavy metals, and phenolic compounds from both water and wastewater. In this paper, the ability of citrulluscolosynthis ash as a bioadsorbent for the removal of reactive red dye is investigated for the first time. Sodium hydroxide is also used to modify the plant ash surface which expectedly enhances its dye removal efficiency. Measurements and removal levels are determined using a UV-vis spectrophotometer. Finally, the effects of pH, adsorbent dosage, dye concentration, and reaction time on dye removal efficiency are also explored. Results show that the optimum conditions to achieve maximum dye removal are as follows: A pH level of 2, an adsorbant dosage of 1.75 g l⁻¹, an initial concentration equal to 90 mg L⁻¹, and A reaction time of 70 min. Adsorption isotherm is found to obey the Ferundlich isotherm. Also, an adsorption capacity of 36 mg g⁻¹ is achieved under the best conditions. It may thus be concluded that modified citrulluscolosynthis ash can be used as an effective adsorbent to treat colored wastewaters.

Keywords: Red Dye, Removal Efficiency, Biosorption, Modified Ash, Citrulluscolosynthis.

Phytoremediation of Oil-contaminated Soils Around Isfahan Oil Refinery

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Abstract

Petroleum compounds are pollutants that most commonly occur in soils around oil refineries and that often find their ways into groundwater resources. Phytoremediation is a cost-effective alternative to physicochemical methods for oil-contaminated soil remediation. In this study, a greenhouse experiment was conducted to evaluate the phytoremediation of oil-contaminated soils around Isfahan Oil Refinery. Four different plants (sorghum, barley, agropyron, and festuca) were initially evaluated in terms of their germinability in both contaminated and control (non-contaminated) soils. Sorghum and barley (recording the highest germinability values) were chosen as the species for use in the phytoremediation experiments. Shoot and root dry weights, total and oil-degrading bacterial counts, microbial activity, and total concentrations of petroleum hydrocarbons (TPHs) were determined at harvest 120 days after planting. A significant difference was observed in the bacterial counts (total and oil-degrading bacteria) between the planted soils and the control. In contaminated soils, a higher microbial activity was observed in the rhizosphere of the sorghum soil than in that of barley. TPHs concentration decreased by 52%–64% after 120 days in contaminated soil in which sorghum and barley had been cultivated. This represented an improvement of 30% compared to the contaminated soil without plants. Based on the results obtained, sorghum and barley may be recommended for the removal of petro-contaminants in areas close to Isfahan Oil Refinery. Nevertheless, caution must be taken as such cultivated lands may need to be protected against grazing animals.

Keywords: Soil Contamination, Petroleum Contaminants, Remediation, Sorghum, Barley.

Failure Event Probability Calculation in Wastewater Collection Systems Using the Bayesian Network

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Abstract

Wastewater systems form an important urban infrastructure that are used for the collection and treatment of wastewater for return into the environment or water reuse. The sewers network in this system forms its most important component, any failure in which may lead to adverse consequences and disruption in urban life. Proper functioning of a sewers network depends on its operation and maintenance (O&M) program that requires timely inspections to identify the high risk sewers with any likelihood of failure in order to gurantee the sustained and sound performance of the whole network. In this study, the Bayesian network is used to develop a model for calculating failure event probability in wastewater collection systems. Given the capabilities of the Bayesian network and the characteristic features of the sewers network, the proposed model is capable of predicting likely failure events. The procedure used for model implementation consists of the following four main steps: preparation of model inputs, training the Bayesian network, validation of the trained network, and receiving output results. To illustrate the application of this method, part of Tehran wastewater collection system is selected as a case study and failure probabilities are calculated. Based on the model results, Tehran sewers can be divided into five categories priotized according to inspection and maintenance requirements. The results indicate that the probability of failure for most of the existing sewers is very low and low (37%) or moderate (60%) due to the newly annexed sewers in the collection system.

Keywords: Failure Probability, Wastewater Collection Network, Sewer, Bayesian Network.

Using Spatial Clustering in Forecasting Groundwater Quality Parameters by ANFIS

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Abstract

Groundwater is a major source of water supply for domestic, agricultural, and industrial uses; hence, its quality modeling is an important task in hydro-environmental studies. While many data-based models have been developed for this purpose, the performance of such data-based models can be drastically enhanced if they are based on temporal and spatial pre-processing. In this study, geostatistics tools (e.g., Co-Kriging), as spatial estimators, and self-organizing map (SOM), as a clustering technique, were employed in conjunction with Adaptive Neuro-Fuzzy Inference System (ANFIS) for the temporal forecasting of such quality parameters as electrical conductivity (EC) and total dissolved solids (TDS) of the groundwater in Ardabil Plain. Using the results thus obtained, the impact of spatial data clustering was also investigated on the same parameters. The results showed that, if proper input data are selected, the proposed spatial clustering technique is capable of improving groundwater quality forecasts made by ANFIS.

Keywords: Geostatistics, Adaptive Neuro-Fuzzy Inference System, Groundwater Quality Parameters, Clustering Method, Ardabil Plain.

Sorption of Lead (Pb) from Aqueous Solutions by Sepiolite and Bentonite Modified with Chitosan Biopolymers: Isotherms and Kinetics

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Abstract

In this study, sepiolite and bentonite clay minerals were modified with a natural chitosan biopolymer and the modified-clays were characterized using XRF, XRD, FTIR, SEM, and TOC analyses. The isothermal and kinetic parameters of lead (Pb) sorption by both the minerals and the modified-minerals were determined in a batch mode under various conditions such as different contact times and initial concentrations of Pb. It was found that the Freundlich model described well the isotherm experimental data of Pb sorption by the sorbents. Modification with chitosan, however, decreased the Pb adsorption capacity of sepiolite from 83 to 27 mg g⁻¹ and that of bentonite from 56 to 29 mg g⁻¹. Kinetic results showed that more than 24 hours was required for Pb sorption by the natural clays to reach equilibrium, while the equilibrium time reduced to 16 and 4 hours for Pb sorption on chitosan-sepiolite and chitosan-bentonite, respectively. The pseudo-second-order model well described the time-dependent Pb sorption data by sepiolite, chitosan-sepiolite, and chitosan-bentonite, suggesting that chemical sorption is the rate-limiting step of Pb adsorption mechanism. The Pb sorption data by bentonite showed the best fit with Elovich model.

Keywords: Lead Sorption Isotherm, Polymer-Clay Composite, Bentonite, Sepiolite, Chitosan, Water Purification.

Land Use Management by Assessing Aquifer Vulnerability in Khovayes Plain Using the DRASTIC and SINTACS Models

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Abstract

Land use change is a gradual process that entails dire consequences for groundwater quality and quantity. Quantitative changes in groundwater can be usually monitored by controlling the annual groundwater balance. Monitoring qualitative changes in groundwater, however, is both time-consuming and expensive. DRASTIC and SINTACS models exploit aquifer properties to predict its vulnerability. In this study, aquifer vulnerability assessment was performed by the DRASTIC & SINTACS models for future land use management in Khovayes, southwest Iran. The DRASTIC Model is based on hydrological and hydrogeological parameters involved in contaminant transport. SINTACS parameters are the same as those of the DRASTIC model, except that weighting and ranking the parameters are more flexible. Once vulnerability maps of the study region had been prepared, they were verified against the nitrate map. A correlation coefficient of 0.4 was obtained between the DRASTIC map and the nitrate one while the correlation between the SINTACS and the nitrate maps was found to be 0.8. Map removal and single-parameter sensitivity analyses were carried out, which showed the southwestern stretches of the study area as the region with the highest risk of vulnerability.

Keywords: DRASTIC, SINTACS, Khovayes, Nitrate Map, Land Use.